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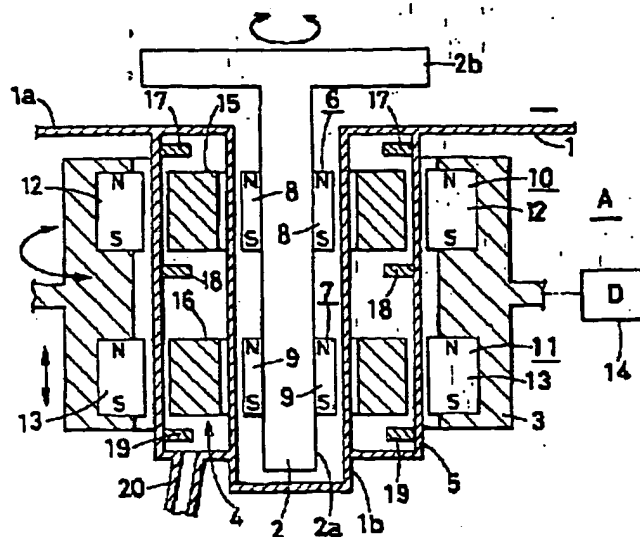
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TITLE : DRIVE DEVICE



ABSTRACT : PURPOSE: To drive a movable body in non-contact condition so as to reduce generation of dust and troubles and facilitate cooling of a superconductor.

CONSTITUTION: This drive device is provided with a first movable body 2 and a second movable body respectively having permanent magnets 8, 9, 12, 13 and relatively movable against a fixed part such as vacuum shield 1, and a cooling housing 5 fixedly provided on the fixed part so as to be positioned between these movable bodies 2, 3. Further, it is provided with an intermediate movable body 4 having superconductors of the second kind 15, 16 which is relatively movably received in the cooling housing 5 in cooled condition and magnetic flux of the permanent magnets 8, 9 of the first movable body 2 and the permanent magnets 12, 13 of the second movable body 3 can be introduced and trapped with, and a drive unit 14 to drive the second movable body 3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is used for for example, a magnetic-levitation slide, the wafer transport device of a vertical-mold diffusion furnace, the wafer carrier robot for vacuums, etc., and relates to a driver-ed at the driving gear of straight-line movement and rotation to which either is made to perform at least.

[0002]

[Description of the Prior Art] The so-called slide bearing using anti-friction bearing as this kind of a driving gear was used conventionally.

[0003] However, since anti-friction bearing was used, generating of dust was not avoided but there was a problem in use under a vacuum or clean environment.

[0004] For this reason, although use of a magnetic bearing can be considered, equipment becomes large-scale in this case, cost is high and an electric and magnetic trouble also has it. [much]

[0005] the [then, / by which these people have been stationed respectively possible / movement / to a fixed portion] -- the [1 movable object and] -- 2 movable objects -- The driving means to which either of two movable objects is moved, the permanent magnet section prepared in one side of the opposite side of two movable objects, the alienation in which the magnetic flux of the above-mentioned permanent magnet section carries out a specified quantity invasion in another side of the above-mentioned opposite side at a row -- the driving gear equipped with the 2nd sort superconductor prepared in the position was proposed (refer to Japanese Patent Application No. No. 43838 [three to])

[0006] With this driving gear, it has in the restricted operation by the magnetic flux of the permanent magnet section which invaded into the superconductor, after the permanent magnet section and the superconductor opened the predetermined interval and have countered, it is held, and another side can be moved by non-contact by moving one side of two movable objects by driving means. For this reason, [0007] with little generating of dust and generating of a trouble

[Problem(s) to be Solved by the Invention] Although it is necessary to cool a superconductor by liquid nitrogen etc. in the case of the above driving gears, since the movable object which has a superconductor is directly connected with driving means or a driver-ed, it is very difficult to cool in the space which had this sealed.

[0008] The purpose of this invention solves the above-mentioned problem, and is for cooling of a superconductor to offer an easy driving gear that there are few generating of dust and troubles.

[0009]

[Means for Solving the Problem] the driving gear by this invention -- respectively -- a permanent magnet -- having -- a fixed portion -- receiving -- the [which can motion relatively] -- the [1 movable object and] -- 2 movable objects -- Cooling housing prepared in the fixed portion in the shape of fixation so that it might be located among these movable objects, it holds possible relative motion] in this cooling housing -- having -- a cooling state -- setting -- the -- the [the permanent magnet of 1 movable object, and] -- the middle movable object which has the 2nd sort superconductor which the magnetic flux of the permanent magnet of 2 movable objects is made to invade, and can carry out the trap of this -- The row is equipped with the driving means which drive the 1st C dynamic body or the 2nd C dynamic body.

[0010]

[Function] the -- the restricted operation of magnetic flux by which the trap of the magnetic flux of the permanent magnet of 1 movable object was invaded and carried out to the superconductor of a middle movable object, and the trap was carried out to the superconductor by invading -- the -- after 1 movable object and the middle movable object opened the predetermined interval and have countered, it is mutually held in the direction of an axial bond, and the direction of a radial the same -- the -- after 2 movable objects and the middle movable object opened the predetermined interval and have countered, it is mutually held in the direction of an axial bond, and the direction of a radial for this reason, driving means -- the -- straight-line-moving and/or making 1 movable object (or the 2 movable objects) rotate -- a middle movable object -- minding -- the -- it can straight-line-move and/or 2 movable objects (or the 1 movable object) can be made to rotate by non-contact

[0011]

[Example] Hereafter, the example of this invention is explained with reference to a drawing.

[0012] the driving gear of this example -- vacuum shield (1) Inner vacuum atmosphere (V) the [which has been arranged in inside] -- 1 movable object (2) Shield (1) The outer atmosphere (A) the [which has been arranged in inside] -- 2 movable objects (3) from -- middle movable object (4) It minds and drives.

[0013] Shield (1) It has the closed-end cylinder wall (1b) extended downward [perpendicular] from the portion of the hole formed in the level wall (1a), and the side of a cylinder wall (1b) and the level wall (1c) bottom are vacuum atmosphere (V). It has become. Moreover, annular cooling housing sealed around the cylinder wall (1b) (5) It is formed in the shape of one.

[0014] the -- 1 movable object (2) it inserts in in the shape of the said heart in a cylinder wall (1b) -- having -- the upper-limit section -- a level wall (1a) -- the upper part -- projection -- it constitutes from a perpendicular shank (2a) and the horizontal plate section (2b) circular, for example formed in the upper limit of a shank at one the bottom -- having -- **** -- shield (1) It receives and has come to be able to perform vertical movement and rotation.

[0015] the [in a cylinder wall (1b)] -- the circumference of 1 movable body-axis section (2a) -- top magnet ring (6) Bottom magnet ring (7) Up and down, a fixed interval is opened and it is fixed. The detail of a top magnet ring (6) is shown in drawing 2. Two or more places, for example, four places, to which each magnet ring (6) and (7) divide the shape of a long thick cylinder equally to nothing up and down, and they divide this equally to a circumferential direction are equipped with a long permanent magnet (8) and (9) up and down. Each permanent magnet (8) and (9) have a magnetic pole to vertical both ends, and the magnetic pole of the same edge is the same. Moreover, the outer diameter of an up-and-down magnet ring (6) and (7) is somewhat smaller than the bore of a cylinder wall (1b).

[0016] The 2nd C dynamic body (3) The shape of a thick cylinder which has a perpendicular axis is arranged in the shape of the said heart around nothing and cooling housing (5). The 2nd C dynamic body (3) Up and down, a top magnet ring (10) and a bottom magnet ring (11) open a fixed interval in inner skin, and are being fixed to it. Two or more places to which each magnet ring (10) and (11) divide the shape of a long thick cylinder equally to nothing up and down, and divide this equally to a circumferential direction are equipped with a long permanent magnet (12) and (13) up and down. Each permanent magnet (12) and (13) have a magnetic pole to vertical both ends, and the magnetic pole of the same edge is the same. The 2nd C dynamic body (3) The bore of a magnet ring (10) and (11) is cooling housing (5). It is somewhat smaller than an outer diameter. Moreover, the 2nd C dynamic body (3) By the suitable drive unit (driving means) (14), it is a shield (1). It receives and vertical movement and rotation are carried out. The 2nd C dynamic body (3) The up-and-down vertical length and the up-and-down mutual interval of a magnet ring (10) and (11) are the 1st C dynamic body (2). It is the same as an up-and-down magnet ring (6) and (7). the -- 2 movable objects (3) the number of the permanent magnet (12) of each magnet ring (10) and (11), and (13) -- the -- 1 movable object (2) It may be the same as it of each magnet ring (6) and (7), and you may differ.

[0017] Middle movable object (4) Cooling housing (5) It consists of ring-like the top superconductors (15) and bottom superconductors (16) which were held inside. An up-and-down superconductor (15) and (16) are housing (5). The crevice between some is opened in radial and it holds in it so that it may receive and may rotate. A top superconductor (15) is housing (5). It can move now up and down between the 1st stopper (17) of the inside upper part, and the 2nd stopper (18) of this pars intermedia. A bottom superconductor (16) is the 2nd stopper (18) and housing (5). It can move now up and down between the 3rd stopper (19) of the inside lower part.

[0018] A superconductor (15) and (16) are the 2nd sort superconductors, and have the property which consist of an yttrium system high-temperature superconductor, for example, the thing which made the usual state electrical-conduction particle (Y2Ba1Cu1) uniformly intermingled inside the substrate which consists of YBa2Cu3Ox , and magnetic flux is made to invade, and carries out the trap of this (it restrains). Housing (5) Inside, refrigerants, such as liquefaction nitrogen, are supplied through a refrigerant pipe (20), and, thereby, a superconductor (15) and (16) are held at a superconductive state.

[0019] Before starting, it is housing (5). A refrigerant was not supplied inside, but the top superconductor (15) was supported by the 2nd stopper (18), the bottom superconductor (16) was supported by the 3rd stopper (19), respectively, and it has stopped in the fixed position. Moreover, the 1st C dynamic body (2) The soffit of a shank (2a) descends to the position equivalent to the bottom of a cylinder wall (1b), and is supported by this position. At this time, it is the 1st C dynamic body (2). Top magnet ring (6) The position of the vertical direction of a top superconductor (15) is in agreement, and it is a permanent magnet (8). The superconductor (15) set the fixed interval and has countered. Moreover, the 1st C dynamic body (2) Bottom magnet ring (7) The position of the vertical direction of a bottom superconductor (16) is in agreement, and it is a permanent magnet (9). The superconductor (16) set the fixed interval and has countered.

[0020] From such a state, it is the 1st C dynamic body (2) as follows, for example. It drives.

[0021] First, it is the 2nd C dynamic body (3) by the drive unit (14). It is made to descend. Make in agreement the position of the vertical direction of a top magnet ring (10) and a top superconductor (15), and while setting a fixed interval and making it counter, a permanent magnet (12) and a superconductor (15) The position of the vertical direction of a bottom magnet ring (11) and a bottom superconductor (16) is made in agreement, a permanent magnet (13) and a superconductor (16) are set and a fixed interval is made to counter.

[0022] In such a state, it is housing (5). A refrigerant is supplied inside, a superconductor (15) and (16) are cooled, and this is held to a superconductive state.

[0023] When a superconductor (15) and (16) will be in a superconductive state, it is the 2nd C dynamic body (3). Many of magnetic flux emitted from the permanent magnet (12) of a top magnet ring (10) will trespass upon the interior of a top superconductor (15), and a trap will be carried out. Here, the virtual pin which it became fixed distributing [of the invasion magnetic flux inside a superconductor (15)] a superconductor (15), therefore set it up to the superconductor (15) since the usual state conductor particle was uniformly intermingled in the interior comes to have pierced through a permanent magnet (12), and a permanent magnet (12) is restrained to a superconductor (15). And it is held, after the permanent magnet (12) and the superconductor (15) opened the interval at that time and have countered by the restricted operation of magnetic flux by which the trap was carried out to such a superconductor (15) by invading. Similarly, it is the 2nd C dynamic body (3). It is held, after the

permanent magnet (13) and bottom superconductor (16) of a bottom magnet ring (11) opened the interval at that time and have countered. Consequently, the 1st C dynamic body (2) Middle movable object (4) Two superconductors (15) and (16) will be mutually supported in the direction of an axial bond, and the direction of a radial.

[0024] Similarly, it is the 1st C dynamic body (2). Middle movable object (4) Two superconductors (15) and (16) will be mutually supported in the direction of an axial bond, and the direction of a radial. At this time, it is the 1st C dynamic body (2). A permanent magnet (8), (9), and the 2nd C dynamic body (3) The size of each part is decided that a permanent magnet (12) and (13) do not do influence mutually.

[0025] In such a state, it is the 2nd C dynamic body (3) by the drive unit (14). If it is made to go up By the restraint of a permanent magnet (12), (13), a superconductor (15), and (16), a superconductor (15) and (16) separate from a stopper (18) and (19), and only the same amount rises. Furthermore, it is the 1st C dynamic body (2) by the restraint of a superconductor (15), (16), a permanent magnet (8), and (9). It separates from the bottom of a cylinder wall (1b), and only the same amount rises. the and] -- 2 movable objects (3) making it move up and down -- a superconductor (15) and (16) -- minding -- the -- 1 movable object (2) It can be made to move up and down.

[0026] Moreover, it is the 2nd C dynamic body (3) by the drive unit (14) in such a state. When it is made to rotate, a superconductor (15) and (16) rotate only the same amount by the restraint of a permanent magnet (12), (13), a superconductor (15), and (16), and it is the 1st C dynamic body (2) further by the restraint of a superconductor (15), (16), a permanent magnet (8),

[0027] Depending on a use, it is a shield (1). It is unnecessary. Moreover, you may make it attach a ring-like superconductor in a middle movable cylinder-like object. instead of [of a top superconductor (15)] -- the -- 1 movable object (2) Permanent magnet (8) the [a corresponding superconductor and] -- 2 movable objects (3) You may prepare the superconductor corresponding to a permanent magnet (12) independently. changing the position of the vertical direction of these two superconductors at this time -- the -- the [the permanent magnet of 1 movable object, and] -- you may make it the permanent magnet of 2 movable objects not do influence mutually The same is said of a bottom superconductor (16). It is not necessary to necessarily prepare a permanent magnet and a superconductor in two or more upper and lower sides.

[0028]

[Effect of the Invention] According to the driving gear of this invention, as mentioned above, a movable object can be driven by non-contact and problems, such as generating of dust, do not arise. Therefore, in a vacua or a clean state, it can be used suitably.

[0029] the middle movable object which has a superconductor -- the -- the [1 movable object and] -- since driving force is only told to another side from one side of 2 movable objects, a middle movable object can be held in cooling housing of the letter of sealing, and it can cool easily

[Translation done.]